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Massachusetts Educational Assessment Program

1996 Statewide Summary

October 1996

Commissioner's Foreword

This report is about how fourth-, eighth- and tenth-grade students in Massachusetts public schools perform in the areas of reading, mathematics, science, and social studies. It contains the results of the 1996 Massachusetts Educational Assessment Program (MEAP), as well as results from four previous administrations of the program. The 1996 MEAP was conducted as planning and development of the new statewide assessment system mandated by the Education Reform Law of 1993 is being implemented. Unlike the MEAP, the new statewide assessments will be designed to report results for individual students, as well as schools and districts.

Results from the MEAP are clear. Student performance in all grades in all content areas has improved slightly or remained the same since 1994. Over eight years, it has increased more significantly. While this is good news, we cannot be satisfied and we cannot stand still. If Massachusetts is to remain competitive with other states and other nations, student performance must rise significantly. This is the goal of the Education Reform Law, which calls for major improvements in school funding, curriculum and instruction, governance, and professional development. These tools, intended to strengthen learning for students and teaching for teachers, will positively affect student performance in the future, if we adhere to our seven year commitment to the law.

In addition to results and important background information about the MEAP, this report also contains examples of actual test questions. The questions provide a flavor for the test—the knowledge and skills tested—and help in understanding the results. While the report does not contain results for individual school districts, that information is available on the department's website (http//www.doe.mass.edu) or at your local library in a report titled *MEAP: Summary of District Performance 1996.*

As a final note, I would like to express my sincere appreciation to the many Massachusetts educators who were integral to the development and administration of the MEAP. The high quality of the assessment program is a tribute to their expertise, hard work, and commitment.

Sincerely,

Robert V. Antonucci

Robert V. Antonucci
Commissioner of Education

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EXECUTIVE SUMMARY

BACKGROUND

The Massachusetts Educational Assessment Program (MEAP) has completed its sixth and final administration. The MEAP has been administered every two years to Massachusetts students at three grade levels in major academic areas since 1986. In the spring of 1996, students at grades 4, 8, and 10 were tested in reading, mathematics, science, and social studies using a combination of multiple-choice questions and open-ended (essay) questions. In the future, the MEAP will be replaced by a new assessment system called for by the Education Reform Law of 1993.

The purpose of the MEAP test is twofold: to furnish information to improve curriculum and instruction in Massachusetts schools, and to provide reliable results for comparison at the school, district, and state levels. The MEAP does not provide individual student results. There is no passing score or failing score. Unlike the MEAP, the new assessment system will report results for individual students as well as schools, districts and the state.

The MEAP results are reported using two kinds of scores: **scaled scores and proficiency levels**. **Scaled scores** describe how schools perform relative to each other. The MEAP uses a scale ranging from 1000 to 1600. The statewide average for each academic area was set at 1300 in 1988 for grades 4 and 8 and in 1994 for grade 10. At the school, district and state levels, only scaled score increases or decreases of 50 points or more are considered educationally significant; a difference in academic performance among groups is detected only when their scores differ by at least 50 points.

Proficiency levels were first emphasized in 1992 to a describe what students actually know and can do. The percentage of students at each of four proficiency levels is reported. Level 1 describes students beginning to grasp factual knowledge. Level 2 describes students with a firm grasp of factual knowledge. Level 3 describes students who are beginning to think critically, solve problems, reason, and communicate effectively. Level 4 describes students who exhibit an exemplary grasp of knowledge, thinking, reasoning and communication skills. Those students whose proficiency does not meet the criteria set for Level 1 are classified as Below Level 1.

HIGHLIGHTS OF THE MEAP RESULTS: 1988-1996

- Statewide performance at grades 4, 8, and 10 in reading, mathematics, science, and social studies remained the same or improved slightly from 1994 to 1996.

- Performance in grade 4 science and grade 8 reading has improved in every MEAP administration since 1988.

- The most significant increase in scores since 1988 is in the area of grade 8 reading. The increases are in three reading subcategories:

  - Content passages (informational non-fiction pieces): up 150 points
  - Inferential Comprehension (where students analyze meaning, evaluate text, and apply prior knowledge to gain understanding of an unfamiliar passage): up 100 points
  - Vocabulary: up 100 points

- The percentage of students at proficiency Level 2 and above has increased steadily from 1992 to 1996 at all grade levels in all academic disciplines, ranging from 55 percent of the students in grade 10 mathematics to 68 percent of the students in grade 4 science and grade 8 reading.

- The percentage of students at proficiency Level 3 and above shows a significant increase from 1994 to 1996 in reading at all three grade levels.

- The percentage of students at the top proficiency Level 4 declined from 1994 to 1996 in most disciplines, except grade 4 science where it remained the same.

MEAP SCALED SCORE RESULTS: 1988-1996

Grade/Subject	1988	1990	1992	1994	1996
Grade 4					
Reading	1300	1310	1330	1350	1350
Mathematics	1300	1310	1330	1330	1330
Science	1300	1310	1330	1350	1360
Social Studies	1300	1310	1330	1340	1340
Grade 8					
Reading	1300	1310	1330	1370	1380
Mathematics	1300	1310	1340	1320	1330
Science	1300	1310	1340	1310	1330
Social Studies	1300	1310	1320	1320	1320
Grade 10					
Reading	Testing was at Grade 12, not Grade 10, in 1988, 1990, and 1992.			1300	1310
Mathematics				1300	1310
Science				1300	1310
Social Studies				1300	1300

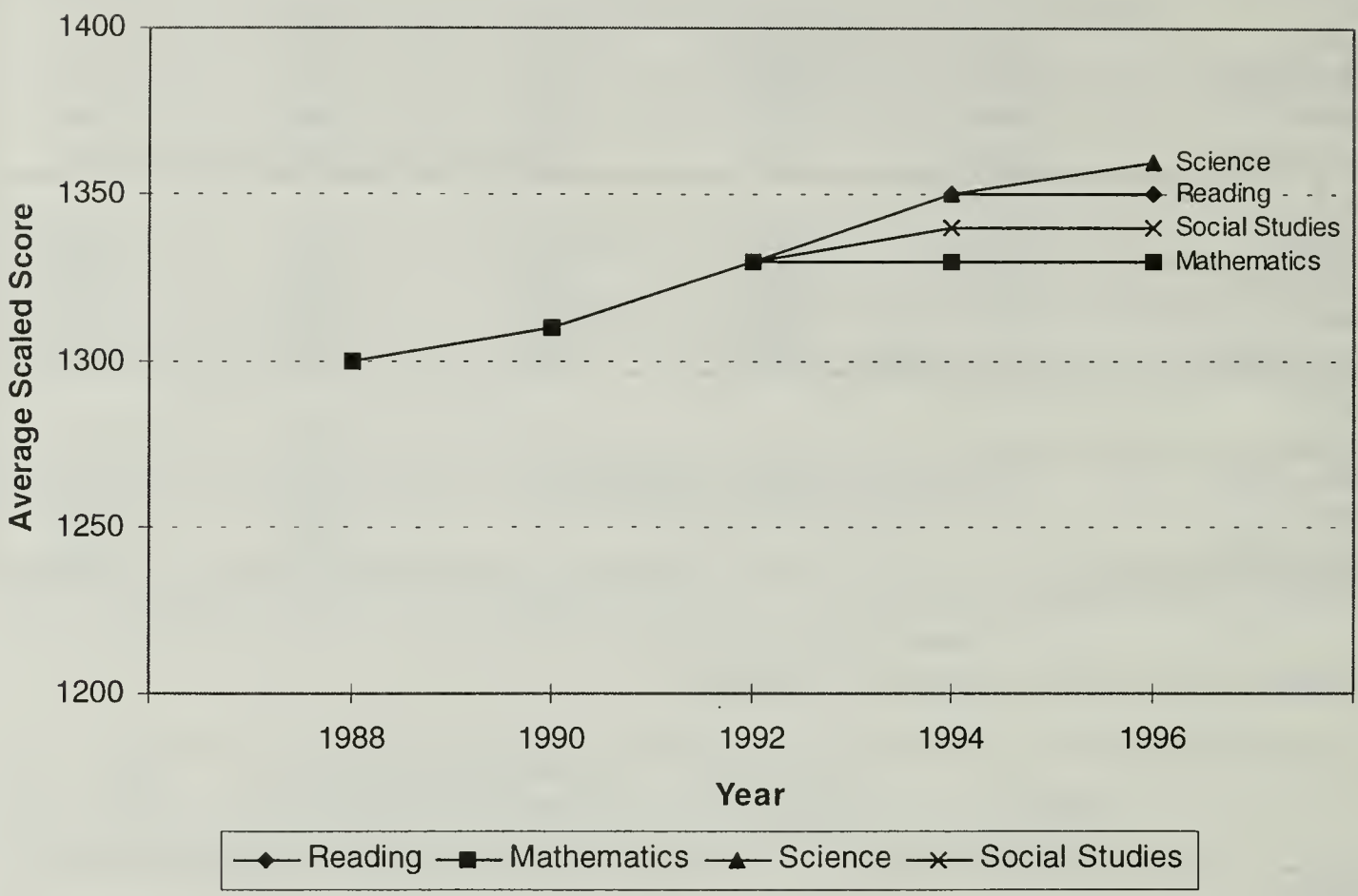
MEAP PROFICIENCY LEVEL RESULTS: 1992-1996

	% Below Level 1			% at Level 1 and Above			% at Level 2 and Above			% at Level 3 and Above			% at Level 4		
	'92	'94	'96	'92	'94	'96	'92	'94	96	'92	'94	'96	'92	'94	'96
Grade 4															
Reading	9	5	7	91	95	93	59	62	64	23	22	27	3	11	3
Mathematics	6	4	4	94	96	96	56	62	64	17	17	15	2	4	2
Science	5	4	3	95	96	97	54	65	68	20	19	20	2	4	4
Social Studies	7	4	3	93	96	97	56	63	65	19	18	17	2	5	3
Grade 8															
Reading	13	10	8	87	90	92	57	60	68	31	27	30	7	13	8
Mathematics	8	8	7	92	92	93	54	57	60	25	20	20	6	6	5
Science	7	11	9	93	89	91	55	55	61	31	20	22	4	6	5
Social Studies	8	10	10	92	90	90	53	56	59	27	22	21	5	7	5
Grade 10															
Reading	-	16	16	-	84	84	-	51	56	-	22	25	-	11	8
Mathematics	-	13	12	-	87	88	-	51	55	-	20	22	-	7	6
Science	-	13	11	-	87	89	-	54	57	-	21	21	-	7	4
Social Studies	-	14	13	-	86	87	-	52	56	-	21	21	-	7	5

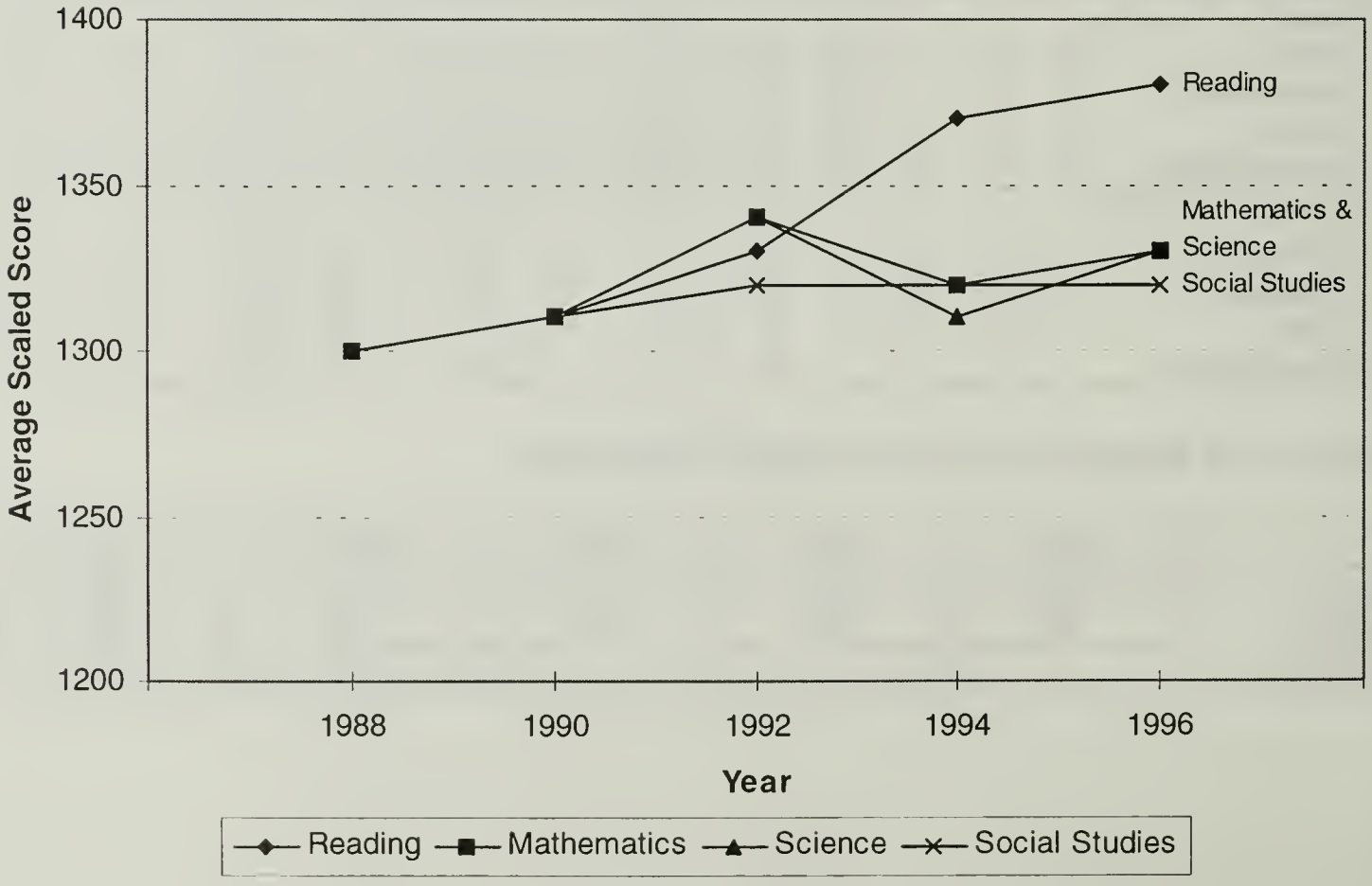
PERCENTAGE OF ENROLLED STUDENTS TESTED: 1988-1996

	1988	1990	1992	1994	1996
Grade 4	90	90	89	90	90
Grade 8	90	89	88	89	89
Grade 10	-	-	-	86	85

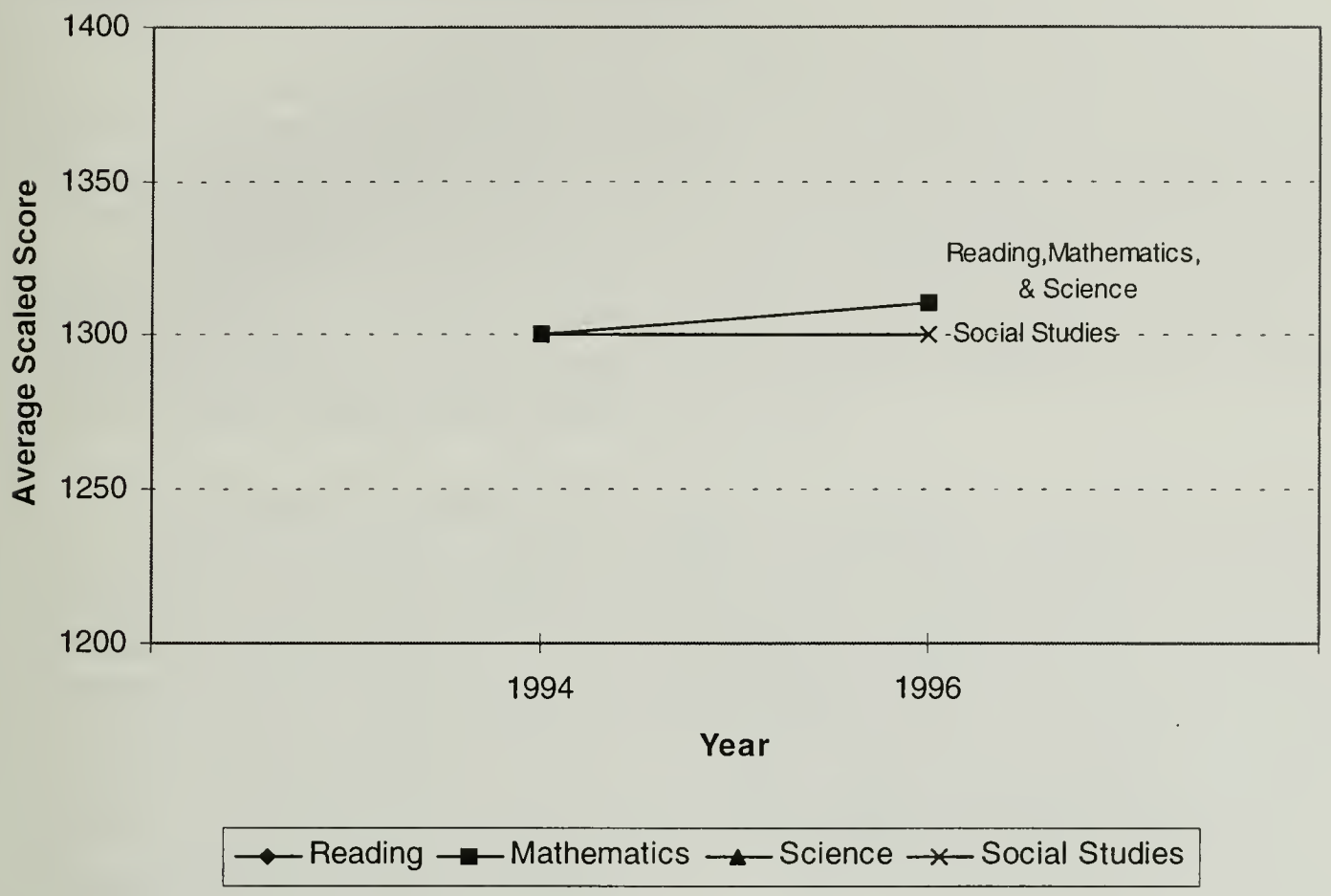
Grade 4 MEAP Scaled Scores: 1988-1996



Grade 8 MEAP Scaled Scores: 1988-1996



Grade 10 MEAP Scaled Scores: 1988-1996



CHAPTER 1: INTRODUCTION

HISTORICAL SUMMARY OF THE MEAP

The Massachusetts Educational Assessment Program (MEAP) was established by the Massachusetts School Improvement Law of 1985, Chapter 188. The law mandated that the MEAP be administered biennially. The MEAP was first administered in April, 1986, with subsequent administrations in 1988, 1990, 1992, and 1994. Although 1994 had been designated as the final administration of the MEAP, an additional round of MEAP testing was conducted in 1996 as planning began for the new statewide assessment program, the Massachusetts Comprehensive Assessment System (MCAS), instituted under the Education Reform Law of 1993.

The MEAP is administered to Massachusetts public school students in three grade levels. In 1986, students in grades 3, 7, and 11 were tested. These grade levels were selected to be consistent with the grade levels tested as part of the National Assessment of Educational Progress (NAEP) in order to permit a comparison of state results with a national sample. In 1988, the grade levels tested by the NAEP were changed to grades 4, 8, and 12. In order to remain aligned with the NAEP grades, the MEAP also began testing students in grades 4, 8, and 12. In 1994, a final change of grades was made when grade 10 students were administered the MEAP in place of grade 12 students. The change to grade 10 testing was made to move toward fulfilling requirements set forth by the Education Reform Law of 1993.

PURPOSE

The purpose of the MEAP is to provide information to improve curriculum and instruction in Massachusetts schools and to provide reliable results for comparisons at the school, district, and state levels. When the grade level tested remains the same, comparisons of performance can be made across years. At grades 4 and 8 comparisons can be made from 1988 through 1996. At grade 10, comparisons can be made between the 1994 and 1996 administrations. Results from the MEAP testing are not reported for individual students. The MCAS will measure and report individual student achievement.

STUDENTS TESTED

All Massachusetts public school students enrolled in grades 4, 8, and 10 are expected to participate in the MEAP testing, with the exception of those who qualified for exemptions. Those who qualified for such exemptions include:

1. students with special needs whose instructional settings were substantially separate from regular classrooms (program prototypes 502.3 and 502.4);

2. students with special needs whose Individualized Educational Plans specified that they not be tested;

3. Limited English Proficient students, except for those enrolled in a Transitional Bilingual Education or ESL Program for three or more years.

Other students not tested were those who were absent from school during testing and scheduled make-up periods. Exclusions on any basis other than those outlined were strictly prohibited.

The table below presents information on the percentage of enrolled students participating in the MEAP at grades 4, 8, and 10 and a breakdown of reasons for exclusion from testing. Approximately 90 percent of the students at grades 4 and 8 and 85 percent of the students at grade 10 participated in the 1994 and 1996 administrations of the MEAP. The lower participation rate in grade 10 is due primarily to a much larger number of absences at grade 10 than at grades 4 and 8. The percentage of enrolled students who qualified for exemptions due to special needs or bilingual status is comparable across grades. In 1996, students with these classifications accounted for 78 percent of the exclusions at grade 4 but only 48 percent of the exclusions at grade 10.

1996 MEAP				Breakdown of Percentage of Students Not Tested		
	Number of Students Enrolled	Percentage of Students Tested	Percentage of Students Not Tested	Special Needs Exemption	Bilingual Exemption	Absence
Grade 4	71,023	90%	10%	7%	1%	2%
Grade 8	65,168	89%	11%	7%	1%	3%
Grade 10	59,681	85%	15%	5%	2%	8%

CONTENT AND FORMAT

The MEAP includes tests in reading, mathematics, science, and social studies. Each test is comprised of multiple-choice and open-ended items developed by the Massachusetts Department of Education; its testing contractor, Advanced Systems in Measurement and Evaluation, Inc. of Dover, New Hampshire; and curriculum advisory committees composed of teachers, curriculum specialists, and administrators from across the state. Open-ended items require students to provide a written response up to one page long, and are scored by professional scorers following individual scoring guides developed for each item. All test items are reviewed by advisory committees to eliminate, as much as possible, gender, ethnic, racial, and cultural bias.

Because the purpose of the MEAP is to report scores at the school and district level, it is possible to cover a broad range of material in a relatively short amount of testing time. The total pool of test questions at a given grade level is divided into several

different test booklets. Each student completes a single test booklet containing approximately 20 multiple-choice questions and one open-ended question in each content area. This testing format produces highly reliable results at the school and district levels.

CHAPTER 2: REPORTING OF MEAP RESULTS

Results from the MEAP are reported using two types of scores: scaled scores and proficiency levels. Scaled scores are used to describe school or district performance relative to that of other schools or districts. Proficiency levels are used to describe the actual performance of students at several points along the score scale.

SCALED SCORES

Scaled scores describe how schools performed relative to one another. The MEAP uses a scale ranging from 1000 to 1600. A separate scale has been created for each grade. In the initial year of testing at each grade (1988 for grades 4 and 8, 1994 for grade 10) the average score for the state in each content area was set at 1300. Therefore, in 1988, a scaled score of 1300 in grade 4 reading and a scaled score of 1300 in grade 8 reading represented the average performance at each grade. This should not be interpreted to mean student performance at grade 4 is equal to student performance at grade 8.

After a scale has been established at a given grade level, it is maintained across subsequent MEAP administrations to permit comparisons of school and district performance over time. That is, scaled scores below 1300 indicate a decline in performance from the initial year of testing, and scaled scores above 1300 indicate an improvement in performance. Real educational changes are detected when scaled scores rise or fall at least 50 points.

Scores on the MEAP, or any test, are estimates of a school's or district's performance at a given point in time. There is error associated with any test score due to factors such as the number of items on the test and the number of students tested. As both of these increase, the error in a score estimate decreases. Consequently, it is likely that scores for a school of 50 students will be less stable than statewide scores comprised of the performance of 50,000 students.

PROFICIENCY LEVELS

Beginning in 1992, in addition to average scaled scores, performance on the MEAP was reported as the percentage of students who perform at different proficiency levels. Proficiency levels are tools that make it possible to describe what students can actually do, and they present a performance profile for each school and district.

Performance on the MEAP is classified into one of four proficiency levels labeled Level 1, Level 2, Level 3, and Level 4. Students whose performance does not demonstrate the skills needed for Level 1 are classified as Below Level 1. Content advisory committees at each grade level and academic discipline reviewed student work on open-ended questions to articulate four distinct proficiency levels. The judgments of these committees were used to set the proficiency level cutpoints. It is important to note that the advisory committees were simply identifying four distinct levels of proficiency. They

were not mapping performance on the MEAP to learning goals or establishing performance standards, or identifying a "passing" and a "failing" level.

Although the proficiency levels are defined separately at each grade level and content area, generic descriptions are used to profile student performance at each level:

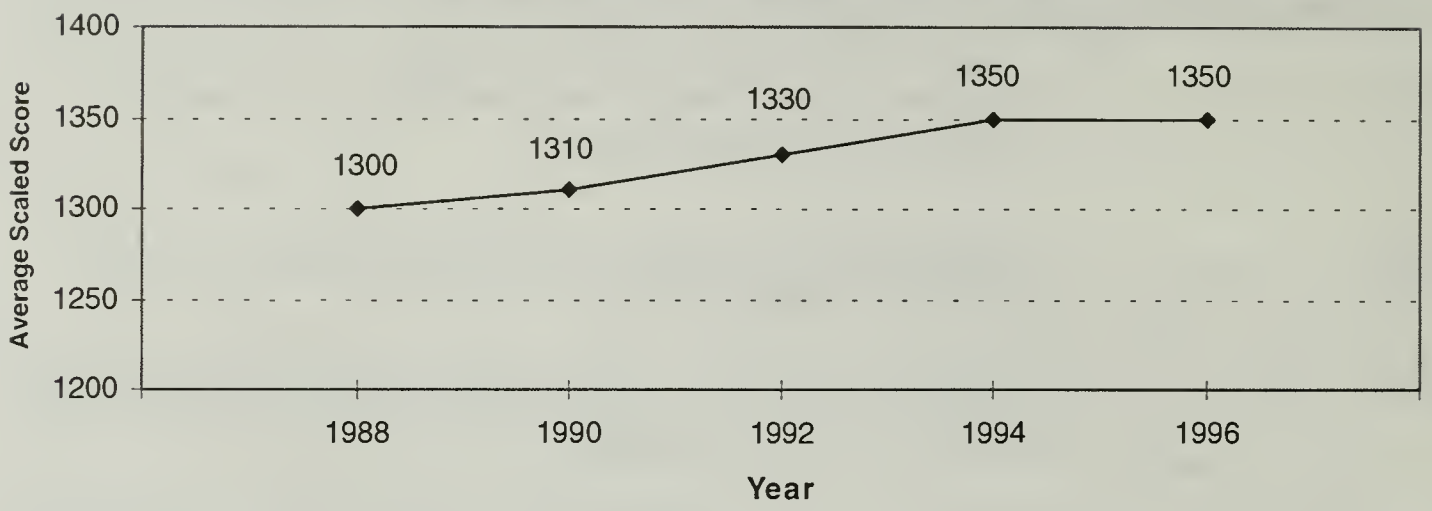
Below Level 1	Responses at this level provide insufficient information to evaluate student performance.
Level 1	Students at this level demonstrate that they are beginning to grasp factual knowledge.
Level 2	Responses at this level indicate that these students have a firm grasp of factual knowledge.
Level 3	Students at this level are beginning to think critically, problem-solve, reason, and communicate effectively.
Level 4	Students at this level exhibit exemplary knowledge, thinking, reasoning, and communication skills.

CONTENT AREA RESULTS

On the following pages, results are presented for the MEAP in each of the academic disciplines at each grade level tested. Each set of results includes information on scaled scores, proficiency levels, and performance in selected subcategories within the content area. Sample multiple-choice and open-ended items are also provided with each set of results. In addition to results of the 1996 MEAP, results are summarized for all MEAP administrations at each grade level. These result sets are intended to provide a complete summary of statewide performance across all administrations of the MEAP at grades 4, 8, and 10.

GRADE 4 READING

Grade 4 Reading: Scaled Scores 1988-1996



- After steady increases from 1988 to 1994, the average performance statewide remained the same from 1994 to 1996.
- Since 1988, the statewide average performance in reading has increased an educationally significant 50 points.
- In 1996, 67 percent of Massachusetts schools scored above the average level of performance established in 1988.

Grade 4 Reading Proficiency Level Distribution: 1992-1996

Proficiency Level/Year	1992	1994	1996
Below Level 1	9	5	7
Level 1 and Above	91	95	93
Level 2 and Above	59	62	64
Level 3 and Above	23	22	27
Level 4	3	11	3

While the percentage of students at Level 2 and above has increased steadily from 59 percent to 64 percent since 1992 and the percentage at Level 3 and above has risen over the same four-year period, the percentage of the students at Level 4 dropped from 11 percent to 3 percent between 1994 and 1996.

Grade 4 Reading - Selected Subcategory Scaled Scores

	1988	1990	1992	1994	1996
Vocabulary	1300	1310	1320	1320	1310
Literal Comprehension	1300	1320	1340	1350	1350
Inferential Comprehension	1300	1310	1330	1360	1350
Literary Passages	1300	1320	1350	1350	1350
Practical Passages	1300	1310	1330	1370	1390

- Vocabulary performance has remained stable across MEAP administrations.
- Performance in Literal Comprehension, where readers locate specific information in a passage, and Inferential Comprehension, where readers use their prior knowledge to make sense of a passage, have increased 50 points since 1988.
- In 1996, students continued to show improvement in the area of Practical Passages which includes such things as sets of directions, manuals, order forms, and reference tools. Since 1988, the rise in scores in this subcategory has been among the most significant (90 points) of any grade's subcategory.

Sample Multiple-Choice Question

If your bike is stolen, the thief may remove its serial number and repaint the bike. Then you'll have a hard time proving the bike is yours. So try this. Write your name and phone number on a small card. Then remove a handgrip, put the card inside the handlebar, and put the handgrip back on. Now, no one but you knows that your bike has a secret ID card.

Published by Xerox Education Publications © 1974.

The main purpose of the article is to

A. describe how to take off your bike's serial number.
B. show you a secret way to identify your bike.
C. warn you to keep your bike away from thieves.
D. explain how to report stolen bikes to the police.

Three multiple-choice questions were asked about this passage.

Sample Open-Ended Question

The Farmer and His Sons

An old Farmer lay on his deathbed. "I would die happy," he thought, "if I could make sure that my sons would take the same good care of the farm as I have done."

He called his two sons to his bedside and said, "My sons, I have not long to live. Listen carefully to what I have to say."

The two young men bent down to catch their father's feeble words. "There is a great treasure hidden in the vineyard," he whispered to them. And so saying, the old Farmer died.

The two sons began to hunt for the treasure. With their spades and plows they turned the soil of the land, but they found neither gold nor precious stones.

However, the vines were strengthened by their careful plowing, and began to yield the richest crop of grapes they had ever seen.

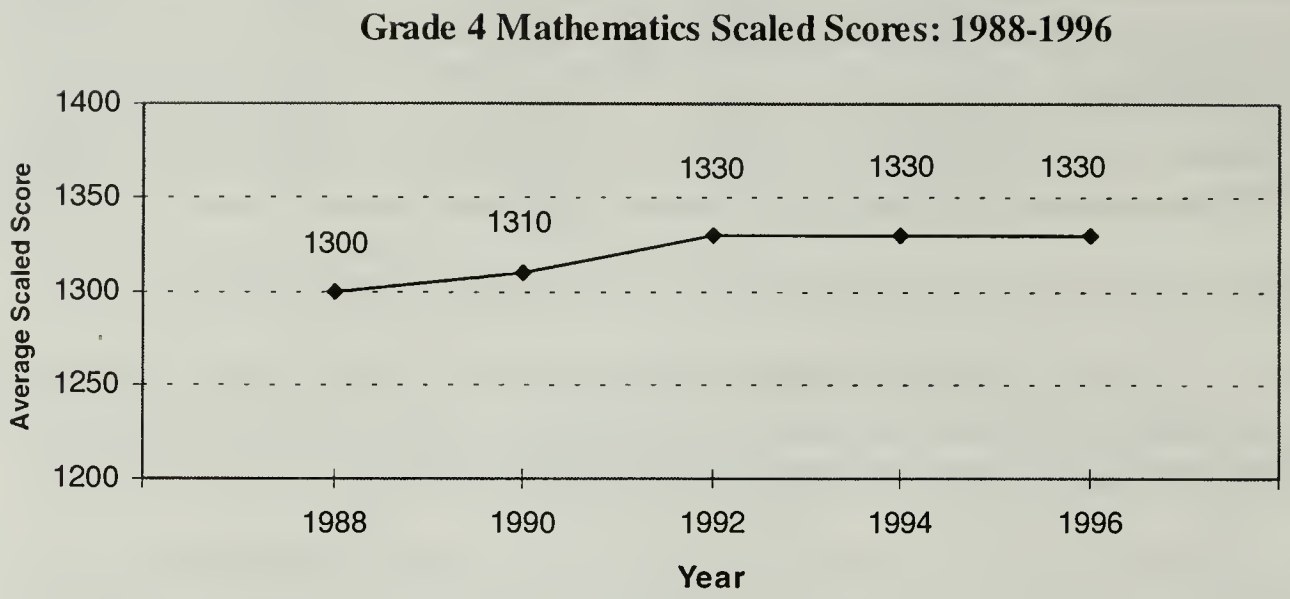
The oldest son turned to his brother and said, "Now I know the treasure of which our dear father spoke. It is our vineyard, which is more precious now than ever."

"Yes," the younger son said. "How wise our father was. He wanted us to learn that *hard work can often yield great riches.*"

From *Aesop's Fables* retold by Ann McGovern. Copyright©1963 Scholastic Inc.

Explain why the old Farmer told his sons there was treasure buried in the vineyard. Use information from the story to support your answer.

GRADE 4 MATHEMATICS



Average statewide performance in mathematics has remained unchanged since 1992.

Grade 4 Mathematics Proficiency Level Distribution: 1992-1996

Proficiency Level/Year	1992	1994	1996
Below Level 1	6	4	4
Level 1 and Above	94	96	96
Level 2 and Above	56	62	64
Level 3 and Above	17	17	15
Level 4	2	4	2

Since 1992, the percentage of students at Level 2 and above has increased steadily from 56 percent to 64 percent.

Grade 4 Mathematics - Selected Subcategory Scaled Scores

	1988	1990	1992	1994	1996
Numbers/Numeration	1300	1310	1330	1350	1350
Operations	1300	1310	1330	1330	1310
Probability/Statistics	1300	1310	1340	1330	1340

- Numbers and Numeration performance remained constant following a steady educationally significant 50-point increase through 1994. Concepts and skills covered in this area include understanding of place value, number order, rounding, using the number line, and recognizing fractional parts.

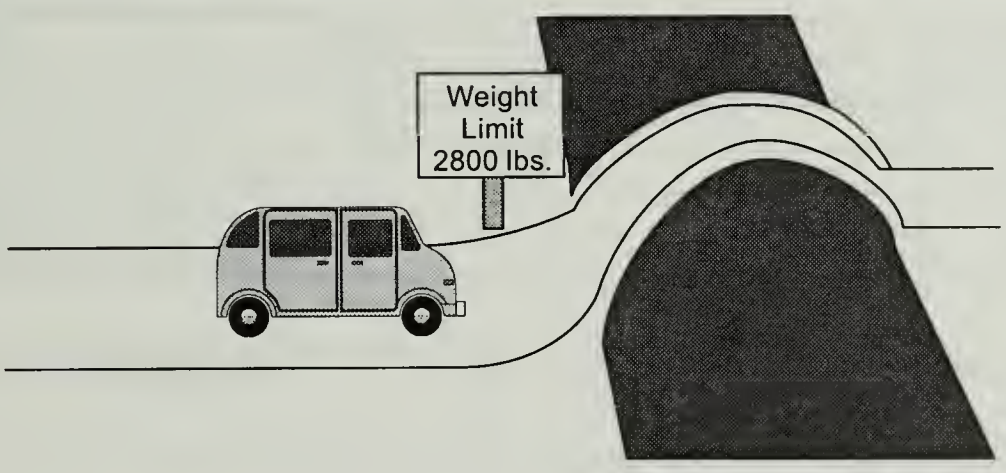
- Performance in Operations, which covers computations with whole numbers and addition and subtraction of fractions, declined from the level reached in 1992 and 1994.

- Performance in Probability and Statistics, which includes informal probability and simple permutations and combinations, has remained at the same level since 1992.

Sample Multiple-Choice Question

Which one of the following is the same as 4 x 7?
A. 47
B. 4 + 7
C. 7 + 7 + 7 + 7
D. 74

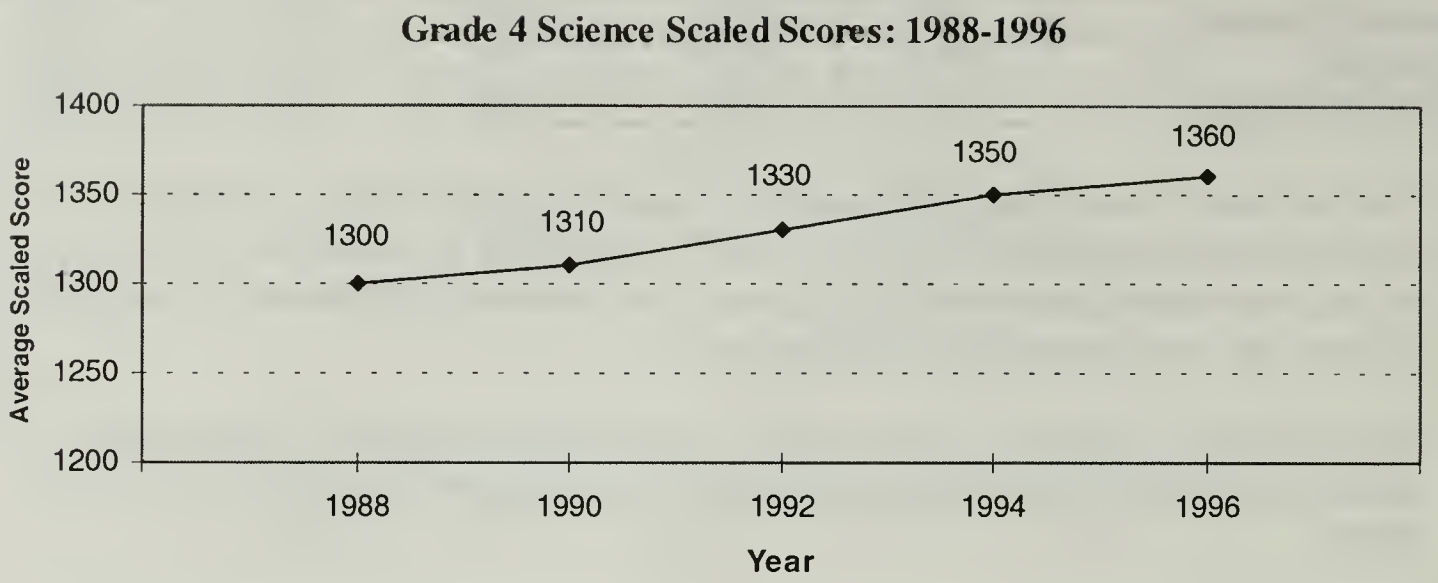
Sample Open-Ended Question



A group of 12 fourth-grade students from a science class takes a field trip to the mountains. On the way, they need to cross a bridge. The weight limit on the bridge is 2800 pounds. The driver says, "The mini-van weighs 2000 pounds. It's not safe to cross the bridge. You will all have to get out and walk." Half the students agree with him and begin to get out of the mini-van. The other six students argue that it is safe for all of them to cross the bridge in the mini-van at one time.

Which group of students do you think is right? Write a convincing argument that explains your reasoning. (Show any math work you do.)

GRADE 4 SCIENCE



- Average statewide performance has improved in every MEAP administration since 1988.
- In 1996, 72 percent of Massachusetts schools performed better than the average level of performance established in 1988.

Grade 4 Science Proficiency Level Distribution: 1992-1996

Proficiency Level/Year	1992	1994	1996
Below Level 1	5	4	3
Level 1 and Above	95	96	97
Level 2 and Above	54	65	68
Level 3 and Above	20	19	20
Level 4	2	4	4

There has been a steady increase in the percentage of students performing at Level 2 and above since 1992.

Grade 4 Science - Selected Subcategory Scaled Scores

	1988	1990	1992	1994	1996
Scientific Inquiry	1300	1320	1330	1350	1360
Life Science	1300	1310	1330	1350	1350
Earth/Space Science	1300	1310	1320	1350	1360
Physical Science	1300	1310	1320	1350	1360

- Statewide performance in all four subcategories has improved since 1988.
- Scientific Inquiry counts for half of the total science score, and includes three major components as follows:
  - Designing Investigations: students are expected to identify the best step or sequence of steps to investigate a problem or answer a question.
  - Data Gathering: students should be able to determine the best method to collect information in a situation, identify appropriate instruments, and make observations.
  - Data Interpretation: students are asked to demonstrate the ability to read and interpret graphs and tables, and draw and evaluate conclusions from data.
- Life Science covers characteristics of life, health, animal life, and plant life.

Sample Multiple-Choice Question

The moon produces no light, and yet it shines at night. What is the best explanation for this?
A. It has many craters.
B. It rotates at a very high speed.
C. It is covered with a fine layer of ice.
D. It reflects the light from the Sun.

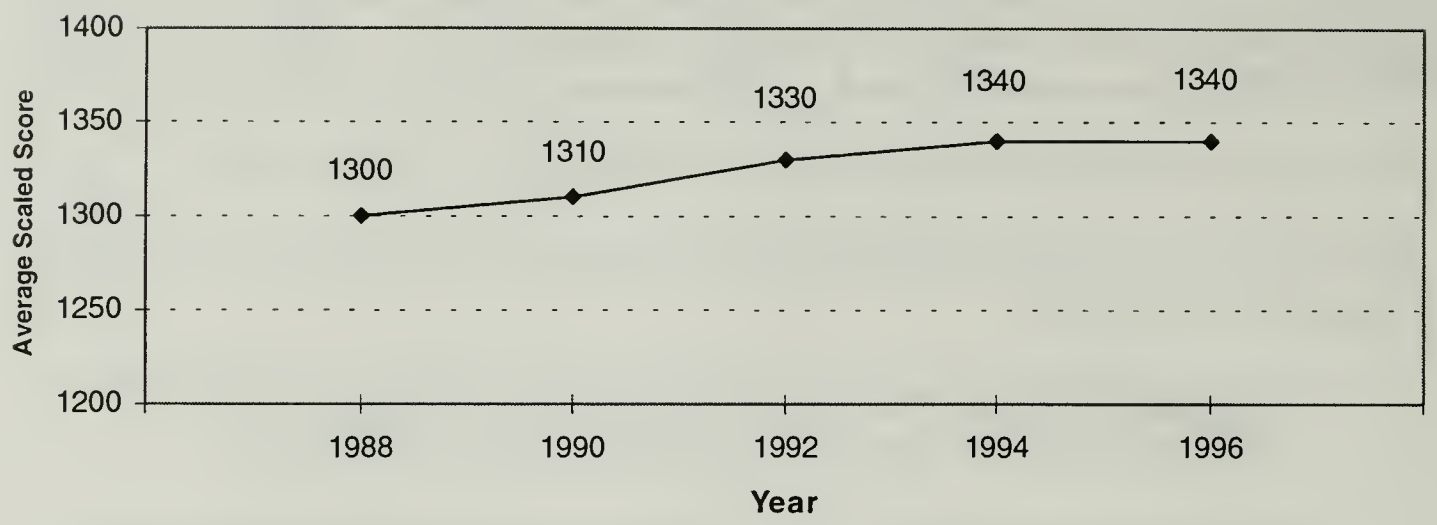
Sample Open-Ended Question

Whenever Bill takes a shower, the bathroom mirror gets foggy and wet. He does not understand why this happens.

a) Explain to him why this happens.
b) Describe a different example of water moving like this. Do not use a shower for your example.

GRADE 4 SOCIAL STUDIES

Grade 4 Social Studies Scaled Scores: 1988-1996



Grade 4 Social Studies Proficiency Level Distribution: 1992-1996

Proficiency Level/Year	1992	1994	1996
Below Level 1	7	4	3
Level 1 and Above	93	96	97
Level 2 and Above	56	63	65
Level 3 and Above	19	18	17
Level 4	2	5	3

The percentages of students at Level 2 and above have increased steadily since 1992.

Grade 4 Social Studies - Selected Subcategory Scaled Scores

	1988	1990	1992	1994	1996
Physical Environment	1300	1330	1350	1340	1360
Historical Environment	1300	1310	1320	1340	1340
Process Skills	1300	1320	1340	1350	1360
Clarifying, Evaluating, and Using Information	1300	1300	1310	1320	1310

- Physical Environment includes questions on physical geography and demographics.
- Historical Environment covers specifics of history and sense of history. Specifics of history may include American colonial life, contributions of significant persons, and historical events; sense of history may include ancestry, change, and connections to history. Performance in this area has remained level since 1994.
- Performance in Process Skills, including map skills, graphic representation, and research skills, has shown steady improvement since 1988.
- Performance in Clarifying, Evaluating, and Using Information has remained at the same level across MEAP administrations.

Sample Multiple-Choice Question

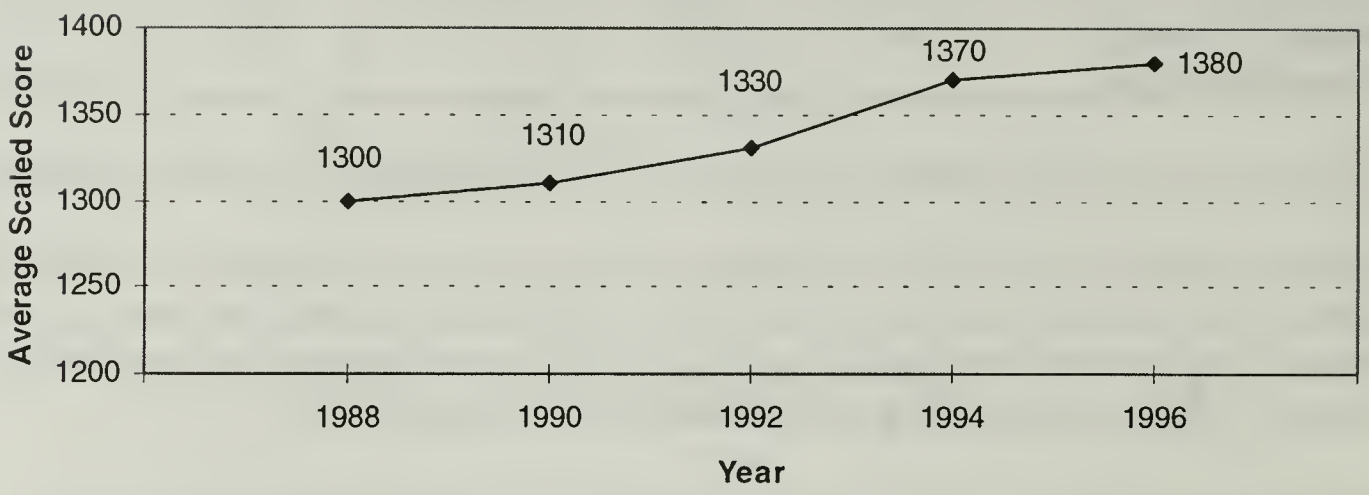
During the Industrial Revolution many people moved from farms to cities MAINLY because
A. there were no longer enough people to buy farm products.
B. they could send their children to school for free in the city.
C. there were many factory jobs available in the cities.
D. city life was much easier than farm life.

Sample Open-Ended Question

Two communities are shown on the map above.
a. What are some jobs that people in community A are more likely to have than people in community B?
b. What are some jobs that people in community B are more likely to have than people in community A?
c. What are some jobs that people in BOTH communities would have?

GRADE 8 READING

Grade 8 Reading Scaled Scores: 1988-1996



- Average performance in grade 8 reading has improved in every administration of the MEAP since 1988.
- In 1996, 77 percent of schools scored above the average level of performance established in 1988.

Grade 8 Reading Proficiency Level Distribution

Proficiency Level/Year	1992	1994	1996
Below Level 1	13	10	8
Level 1 and Above	87	90	92
Level 2 and Above	57	60	68
Level 3 and Above	31	27	30
Level 4	7	13	8

- In 1996, more than two-thirds of students performed at Level 2 and above, and 30 percent of students performed at Level 3 and above, although the percentage at Level 4, the top level, declined from 13 percent in 1994 to 8 percent in 1996.
- The percentage of students at Level 2 and above has increased in each MEAP administration.

Grade 8 Reading - Selected Subcategory Scaled Scores

	1988	1990	1992	1994	1996
Vocabulary	1300	1320	1330	1390	1400
Literal Comprehension	1300	1300	1320	1340	1340
Inferential Comprehension	1300	1320	1330	1380	1400
Literary Passages	1300	1320	1340	1360	1390
Content Passages	1300	1320	1350	1420	1450

- In all subcategories, the improvements that occurred between 1992 and 1994 were maintained or increased in 1996.

- Performance in Literal Comprehension, in which readers locate specific information in a passage, has remained level since 1994. Performance in Inferential Comprehension, which requires students to analyze, evaluate, and use prior knowledge to interpret the text, has improved in every MEAP administration.

- There has been continuing improvement both in Literary Passages, including short stories and passages from larger literary pieces, and in Content Passages, containing informational pieces taken from textbooks or primary source materials used to supplement textbook reading.

Sample Multiple-Choice Question

Volcano!
by Stephen J. O'Meara

As you read this sentence, chances are that molten rock is bleeding from Italy's Mount Etna in Sicily, volcanic bombs are exploding out of Arenal volcano in Costa Rica and lava rivers are pouring from Hawaii's Kilauea volcano. Volcanologists, the men and women who study these living mountains, expect such behavior. In fact, right now about 10 volcanoes are erupting somewhere on Earth. It's a natural way for our planet to release pent-up energy.

Earth is dappled with volcanoes —
perhaps more than 40,000.

About 1,300 are potentially active (meaning they've erupted in the past 10,000 years), and most lie beneath the world's oceans. It's the volcanologists' job to monitor these "windows" to Earth's interior. Their biggest challenges: to predict when a volcano will erupt, to educate local officials about potential hazards, and to set up early-warning systems. These measures can save (and have saved) many lives. Like people, each volcano looks and behaves differently. Some, like conical Mount St. Helens in Washington state, blow gas and ash high into the atmosphere. Others, like long and smooth Kilauea, gush molten lava. And those like Arenal and Etna shoot out mixtures of both. Generally, a volcano's location and composition reveal a lot about how it works.

The Earth's crust is broken into a dozen sections, called tectonic plates, that fit together like a jigsaw puzzle. Some sections move as much as 8 inches per year, and most volcanic activity occurs along their boundaries. If two plates separate, fluid volcanoes fill the gap. The islands of Iceland in the Mid-Atlantic Ridge are examples of this. They belong to a submarine volcanic ridge that runs down the middle of the Atlantic Ocean.

The famous Ring of Fire–the world's largest volcanic "necklace"–marks where the Pacific Ocean's floor plunges underneath the continents surrounding it. The friction between the rubbing plates there melts rock and dissolves seawater, creating a gaseous magma that rises and explodes to the surface as a volcano. The violent eruption of Mount Pinatubo in the Philippines occurred along the Ring of Fire.

The fluid lava that flows across the islands of Hawaii, however, might originate in the Earth's liquid outer core. Large teardrops of molten rock rise through the mantle and puncture the crust at points called "hot spots." In the case of Hawaii, that event happened in the *middle* of the Pacific plate, at ocean bottom. The island of Hawaii's Mauna Loa, the world's largest volcano, rises 33,000 feet above the ocean floor–about 4,000 feet higher than Mount Everest. That's a lot of lava!

Because they rarely explode, the Hawaiian volcanoes of Mauna Loa and Kilauea are relatively safe to watch, even up close. Imagine standing near a molten river at night, watching a vent spray lava 1,000 feet skyward. The volcano sounds like a low-flying 747 jet, and the heat is so intense your skin tingles. You dare not venture farther. Beside you, a tired lava flow snaps, crackles, and pops–like a bowl of Rice Krispies in milk.

On the other hand, nothing in nature can match the power of the volcanoes that dot the Ring of Fire. Two out of every three of Earth's land volcanoes are there, and Indonesia alone harbors more than 127 of them. Some are furious. For example, in 1815, Tambora, near Bali, exploded with the energy of 800,000 hydrogen bombs! It poured about 170 billion tons of volcanic debris into the atmosphere, caused 12,000 deaths on the island, and created a great sea wave that killed another 80,000 people on two neighboring islands. By comparison, the energy released by Mount St. Helens in 1980 was equal to 400 hydrogen bombs and volcanic debris claimed 57 lives. Volcanoes may cause death, but they also sustain life. Ash, for example, is rich in soil nutrients important to plant growth. The livelihood of many developing countries, therefore, depends on agricultural products grown in the fertile soils that surround volcanoes.

The gases making up Earth's early atmosphere were expelled by volcanoes. Today, emissions from Mount Etna alone make up 10 percent of all the carbon dioxide gas that the Earth releases. Etna also might have cause climate changes during the past 100,000 years.

Volcanic ash and gases do affect climate. Tambora caused the "year without a summer." El Chichon apparently provoked a severe Northern Hemisphere winter in 1984. And now, the Earth's average global temperature has dropped 1.5 degrees Fahrenheit because of Mount Pinatubo's eruption. That drop is enough to offset the slight temperature increase in recent years, which some scientists attribute to global warming.

Excerpted from Odyssey's January 1993 issue: *Volcanoes: Scorching Hot to Icy Cold* © 1993, Cobblestone Publishing, Inc., 7 School St., Peterborough, NH 03458. Reprinted by permission of the publisher.

The most difficult aspect of volcanology is

A. determining which way lava will flow from a volcano.
B. understanding what causes eruptions.
C. deciding what to do with the debris from a volcano.
D. predicting when an eruption will occur.

Six multiple-choice questions were asked about this passage.

Sample Open-Ended Question

MOTHER TO SON

Well, son, I'll tell you
Life for me ain't been no crystal stair
It's had tacks in it,
And splinters,
And boards torn up,
And places with no carpets on the floor,

Bare.
But all the time
I'se been climbin'on
And reachin' landin's
And turning corners
And sometimes goin'on in the dark
Where there ain't been no light.
So, Boy, don't you turn back.
Don't you set down on the steps
'Cause you find it's kinder hard.
Don't you fall now—
For I'se still goin,' Honey,
I'se still climbin'
And life for me ain't been
no crystal stair.

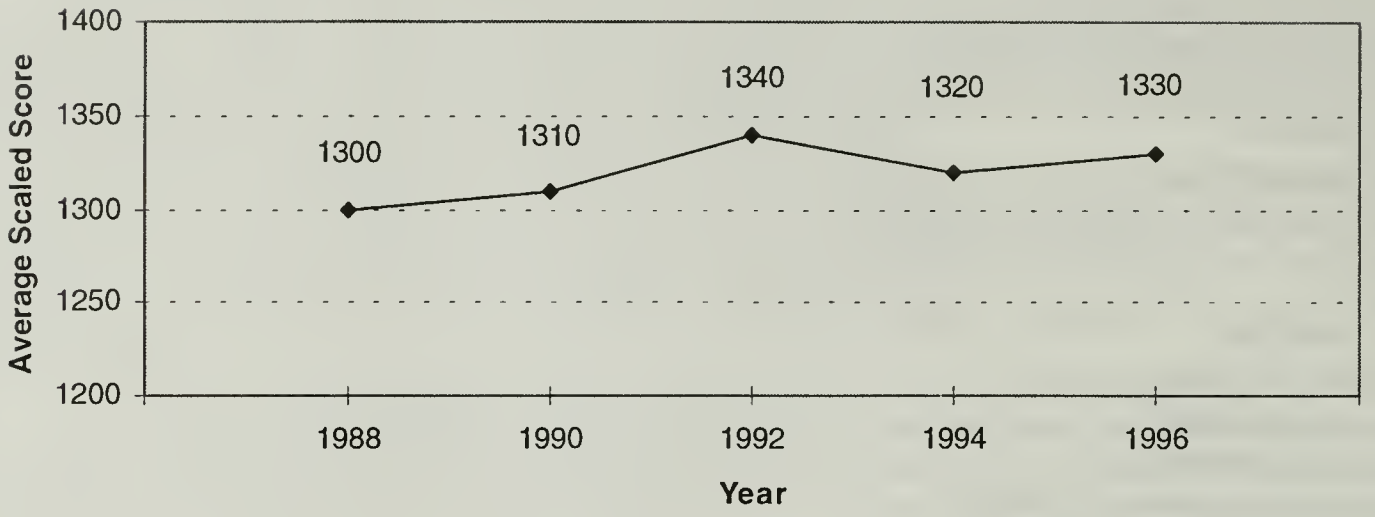
LANGSTON HUGHES

From *Selected Poems* by Langston Hughes. Copyright 1926 by Alfred A. Knopf Inc. and renewed 1954 by Langston Hughes. Reprinted by permission of the publisher.

The mother in the poem "Mother to Son" uses the image of a staircase to describe her experiences and ideas about life. What are the **main ideas** about life the mother is sharing with her son? Explain how at **least three details** about the staircase are used to describe experiences in the mother's life.

GRADE 8 MATHEMATICS

Grade 8 Mathematics Scaled Scores: 1988-1996



Grade 8 Mathematics Proficiency Level Distribution: 1992-1996

Proficiency Level/Year	1992	1994	1996
Below Level 1	8	8	7
Level 1 and Above	92	92	93
Level 2 and Above	54	57	60
Level 3 and Above	25	20	20
Level 4	6	6	5

- The percentage of students at Level 2 and above has increased steadily from 54 percent to 60 percent since 1992.
- Fewer than 10 percent of the students performed below Level 1 in each MEAP administration.

Grade 8 Mathematics - Selected Subcategory Scaled Scores

	1988	1990	1992	1994	1996
Measurement/Geometry	1300	1310	1330	1320	1320
Variables/Relations	1300	1310	1340	1310	1330
Probability/Statistics	1300	1310	1340	1330	1340

- Measurement and Geometry, which comprises a quarter of the mathematics test items, had the least amount of improvement in performance from 1988 to 1992. Performance in this subcategory has not changed since 1994.

- Performance in the area of Variables and Relations, which includes solving simple equations and inequalities and understanding graphic representations, improved from 1994 to 1996.

- Probability and Statistics includes the computation of exact probabilities and averages. Performance improved from 1988 to 1992 and has remained stable since then.

Sample Multiple-Choice Question

Johnna's father wants her to mark the space for a vegetable garden with a cord. He gives her a cord 40 feet long. Which of the following shapes should she make the garden in order to have the largest area to grow vegetables?

A. a triangle
B. a rectangle
C. a square
D. It doesn't matter because the perimeter will always be the same.

Sample Open-Ended Question

Jessie is the program manager in charge of planning the half-hour TV program block that begins at 8:00:00 P.M. and ends at 8:30:00 P.M. (NOTE: 8:30:00 means 8 hours, 30 minutes, and 0 seconds; in other words, exactly eight-thirty.)

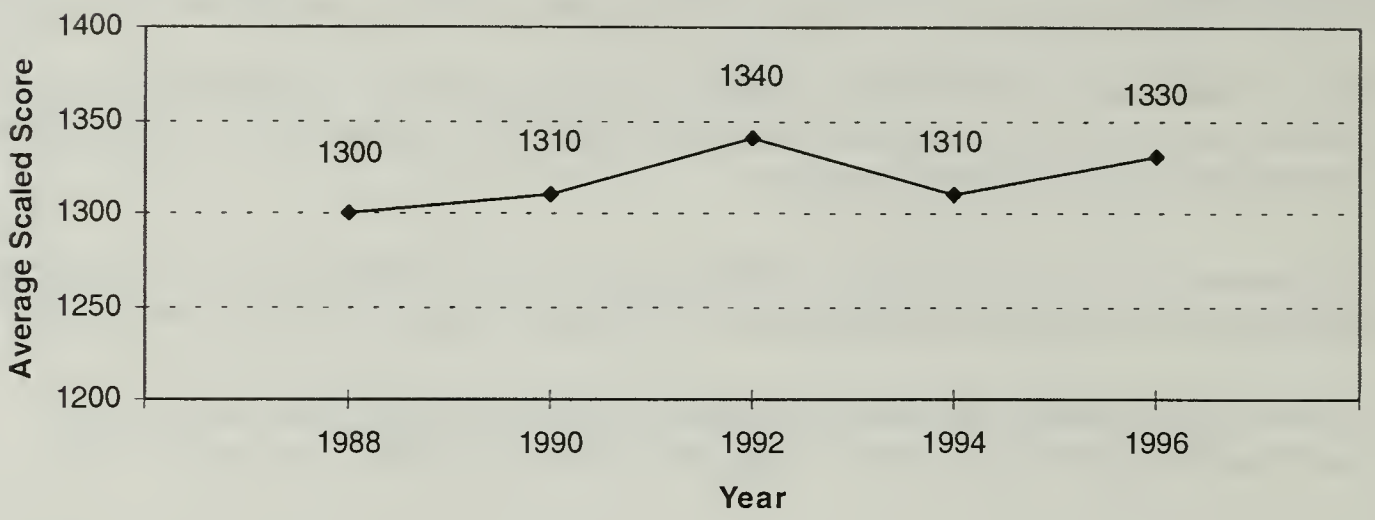
The following must be included in the half-hour:

- a program lasting exactly 22 minutes, divided into a 1-minute introduction, and three 7-minute segments
- four commercial breaks, one after the introduction and one after each program segment
  - Each commercial break must be at least 1.5 minutes long, but no longer than 3 minutes.
  - All of the following commercials must be shown:
    - Golden Soap – three 30-second spots
    - Fast Chicken – two 60-second spots
    - Tonight's movie – three 60-second spots
    - Belle Department Store – two 30-second spots

If there is time remaining, there are 15-second public service announcements that can be used.

Prepare a schedule for the half-hour show that tells exactly when the program segments, the commercials, and any public service announcements will appear. Give the beginning and ending time for each piece, listing the pieces in order from 8:00:00 to 8:30:00.

GRADE 8 SCIENCE



Grade 8 Science Proficiency Level Distribution: 1992-1996

Proficiency Level/Year	1992	1994	1996
Below Level 1	7	11	9
Level 1 and Above	93	89	91
Level 2 and Above	55	55	61
Level 3 and Above	31	20	22
Level 4	4	6	5

The percentage of students at Level 2 and above increased from 55 percent in 1994 to 61 percent in 1996.

Grade 8 Science - Selected Subcategory Scaled Scores

	1988	1990	1992	1994	1996
Scientific Inquiry	1300	1310	1350	1320	1340
Life Science	1300	1320	1340	1310	1330
Earth/Space Science	1300	1310	1320	1310	1330
Physical Science	1300	1300	1320	1260	1300

- Performance in all subcategories increased from 1994 to 1996.
- Scientific Inquiry counts for half of the total science score, and includes three major components:
  - Designing Investigations: students are expected to identify the best step or sequence of steps to investigate a problem or answer a question.
  - Data Gathering: students should be able to determine the best method to collect information in a situation, identify appropriate instruments, and make observations.
  - Data Interpretation: students are asked to demonstrate the ability to read and interpret graphs and tables, and draw and evaluate conclusions from data.
- Performance in Physical Science, which declined significantly in 1994, rebounded to 1300 in 1996.

Sample Multiple-Choice Question

Many scientists suggest that the best way to reduce the mosquito population in an area is to reduce the amount of standing water. This is because

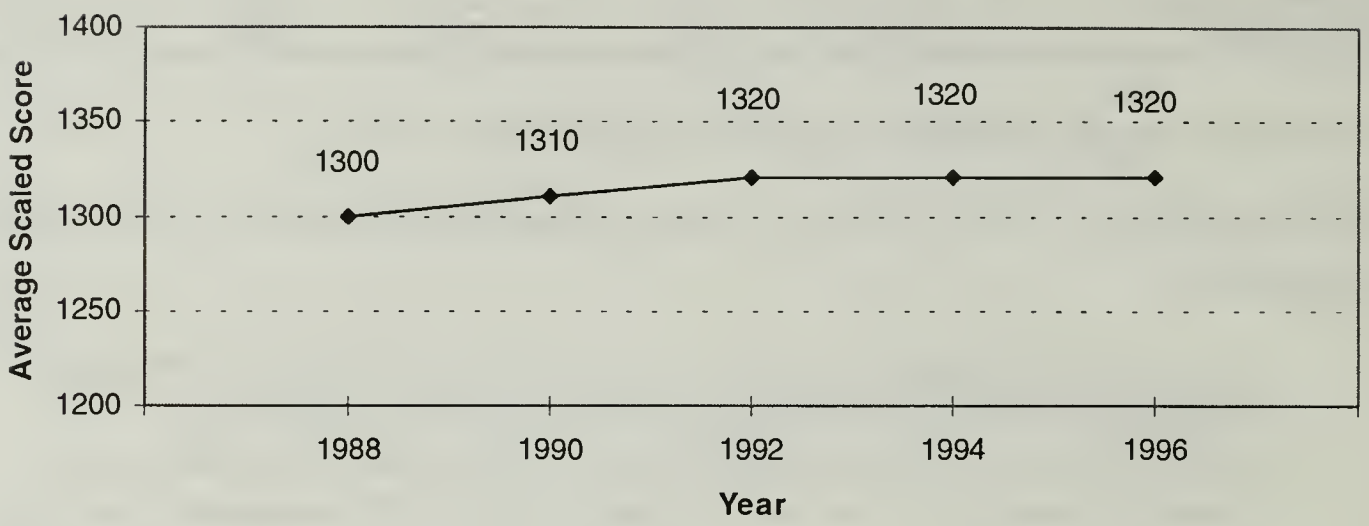
A. the adult mosquitoes must live in the water.
B. mosquitoes need water to reproduce.
C. the use of standing water for human recreation increases the mosquito population.
D. the adult male mosquito must remain wet at all times since it does not eat.

Sample Open-Ended Question

You have a mixture of salt, sand, and tiny pieces of iron. Describe how you would separate the mixture into each of its three parts. Be sure to explain your steps in order.

GRADE 8 SOCIAL STUDIES

Grade 8 Social Studies Scaled Scores: 1988-1996



Grade 8 Social Studies Proficiency Level Distribution

Proficiency Level/Year	1992	1994	1996
Below Level 1	8	10	10
Level 1 and Above	92	90	90
Level 2 and Above	53	56	59
Level 3 and Above	27	22	21
Level 4	5	7	5

The percentage of students performing at Level 2 and above has increased steadily from 53 percent in 1992 to 59 percent in 1996.

Grade 8 Social Studies - Selected Subcategory Scaled Scores

	1988	1990	1992	1994	1996
Historical Environment	1300	1300	1300	1310	1290
Sociocultural Environment	1300	1320	1330	1340	1360
Process Skills	1300	1320	1330	1340	1370

- Historical Environment encompasses specifics of world and United States history, including contemporary United States history.

- Sociocultural Environment covers the various elements of society (e.g., family, religion, and education) and the roles of social organizations. This area also includes social change and social problems. Scores have shown a steady improvement since 1988.

- Performance in Process Skills, including map skills, graphic representation, and research skills, has shown steady improvement since 1988.

Sample Multiple-Choice Question

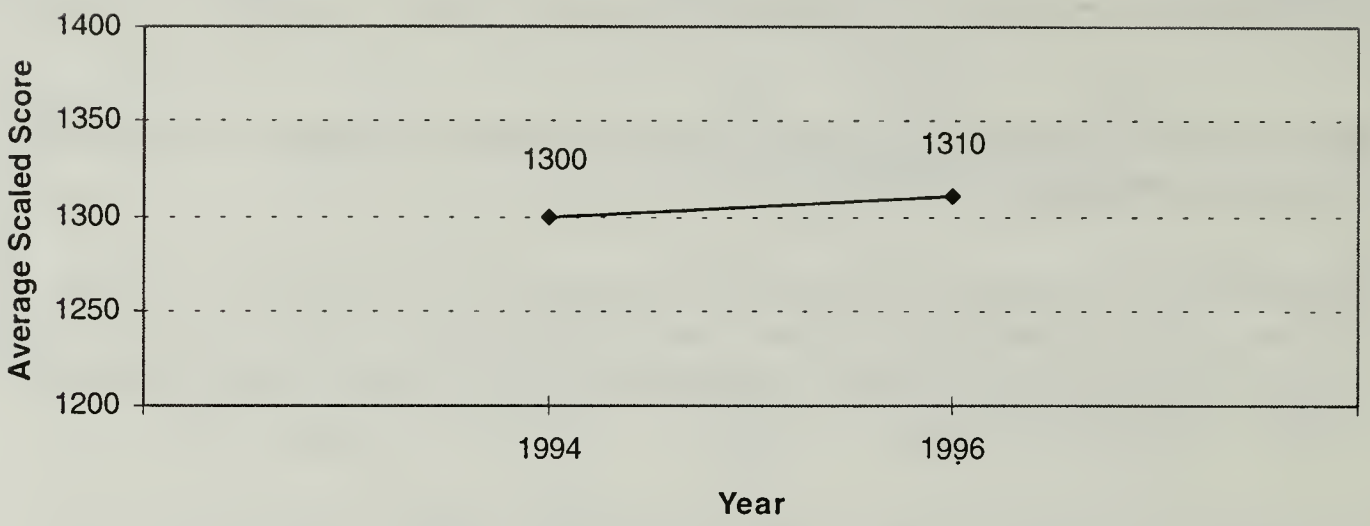
The construction of the Panama Canal shortened the sailing time between New York and
A. London.
B. Port-au-Prince.
C. Rio de Janeiro.
D. San Francisco.

Sample Open-Ended Question

"We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty, and the pursuit of Happiness..."

Identify the document. Explain why the document is important in American history.

GRADE 10 READING



Grade 10 Reading Proficiency Level Distribution: 1994-1996*

Proficiency Level/Year	1992	1994	1996
Below Level 1	-	16	16
Level 1 and Above	-	84	84
Level 2 and Above	-	51	56
Level 3 and Above	-	22	25
Level 4	-	11	8

*Grade 10 testing began in 1994.

Grade 10 Reading - Selected Subcategory Scaled Scores

	1994	1996
Vocabulary	1300	1290
Literal Comprehension	1300	1280
Inferential Comprehension	1300	1320
Literary Passages	1300	1300
Content Passages	1300	1320

Inferential Comprehension accounts for 64 percent of the questions on the test and requires students to analyze, evaluate, and use their prior knowledge to make sense of the text.

Sample Multiple-Choice Question

JOB MYTHS

A surprising number of determined men and women are finding good jobs in fields that the career counselors have discounted. How? Many have done this by not succumbing to the following myths often associated with getting a good job.

Myth Number 1: Let the government be your indicator. Many people have looked at job projections provided by the United States government and the Department of Labor and chosen careers based on their predictions. Each year the Department of Labor publishes the *Dictionary of Occupational Titles* that identifies various career opportunities. In addition, the Bureau of Labor Statistics provides information on the different types of jobs available. Unfortunately, both sources list occupations that no longer exist. In addition, they often fail to mention occupations in new fields, such as artificial intelligence and instructional design in industry.

Myth Number 2: Go for high-tech jobs; forget low-tech jobs. Many people believe that the major growth industries are in high-technology areas. The point, however, is that high technology has created an important need for low-technology jobs. The most prevalent of these jobs is teaching. In order to train future generations how to operate sophisticated equipment, even at the level of the assembly line, more and more teachers will be needed in industry. In addition, the need to train people in sophisticated information-management systems, such as those used in banks, will require a large number of teachers.

Myth Number 3: You will go farther if you are a specialist rather than a generalist. Many people believe that it is better to know a lot about one thing than a little about many things. The point, however, is that many jobs are now requiring people to be able to synthesize a variety of different disciplines. What is important is the ability to integrate knowledge to solve problems rather than simply analyze a problem into its component parts. In addition, by being a generalist, one is more likely to get a job because one is able to qualify for a range of different jobs. Because more and more people are trained as specialists and because more and more jobs are requiring generalists, people trained as generalists are more likely to become employed.

According to the passage, what role do teachers play in high-technology fields?

A. They train people in basic computer programs and in the use of certain machines.
B. They train people in information-systems management and in the use of sophisticated equipment.
C. They train people in a variety of specialized areas of information-systems transmission.
D. They train people in bank management procedures.

Five multiple-choice questions were asked about this passage.

Sample Open-Ended Question

The excerpt below is from Fyodor Dostoevsky's *Crime and Punishment.* In this scene set in a bar, Marmeladov has just met Raskolnikov, and begins describing his wife, Katerina Ivanova, and his family life.

Katerina Ivanova

". . . Know then that my wife was educated in a high-class school for the daughters of noblemen, and on leaving she danced the shawl dance before the governor and other personages for which she was presented with a gold medal and a certificate of merit. The medal . . . well, the medal of course was sold—long ago, hm . . . but the certificate of merit is in her trunk still and not long ago she showed it to our landlady. And although she is most continually on bad terms with the landlady, yet she wanted to tell some one or other of her past honours and of the happy days that are gone.

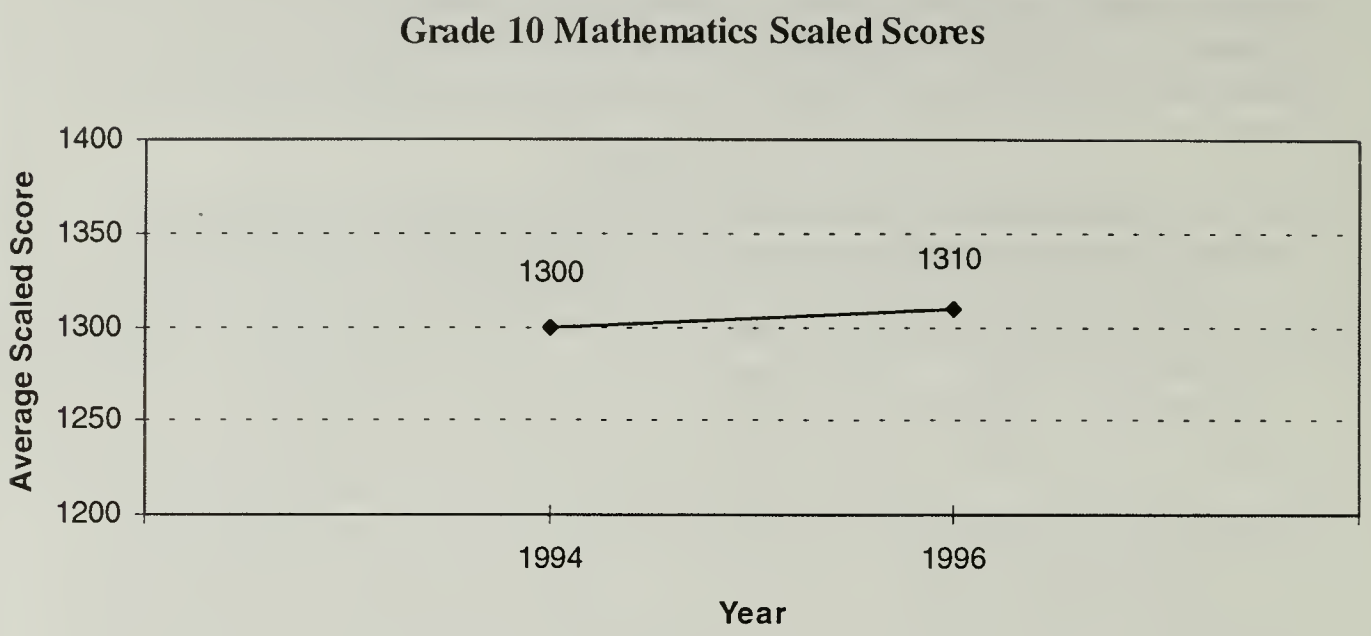
Don't condemn her for it, I don't blame her, for the one thing left her is recollection of the past, and all the rest is dirt and ashes. Yes, yes, she is a lady of spirit, proud and determined. She scrubs the floors herself and has nothing but black bread to eat, but won't allow herself to be treated with disrespect. That's why she would not overlook Mr. Lebeziatnikov's rudeness to her, and so when he gave her a beating for it, she took to her bed more from the hurt to her feelings than from the blows. She was a widow when I married her, with three children, one smaller than the other. She married her first husband, an infantry officer, for love, and ran away with him from her father's house. She was exceedingly fond of her husband; but he gave way to cards, got into trouble and with that he died. He used to beat her at the end; and although she paid him back, of which I have authentic documentary evidence, to this day she speaks of him with tears and she throws him up at me; and I am glad, I am glad that, though only in imagination, she should think of herself as having once been happy . . . And she was left at his death with three children in a wild and remote district where I happened to be at the time; and she was left in such hopeless poverty that, although I have seen many ups and downs of all sort, I don't feel equal to describing it even. Her relations had all thrown her off. And she was proud, too, excessively proud . . . And then, honoured sir, and then, I, being at the time a widower, with a daughter of fourteen left me by my first wife, offered her my hand, for I could not bear the sight of such suffering. You can judge the extremity of her calamities, that she a woman of education and culture and distinguished family, should have consented to be my wife. But she did! Weeping and sobbing and wringing her hands, she married me! For she had nowhere to turn! Do you understand, sir, do you understand what it means when you have absolutely nowhere to turn? No, that you don't understand yet . . . And for a whole year, I performed my duties conscientiously and faithfully, and did not touch this" (he tapped the jug with his finger), "for I have feelings. But even so, I could not please her; and then I lost my place too, and that through no fault of mine but through changes in the office; and then I did touch it! . . . It will be a year and a half ago soon since we found ourselves at last after many wanderings and numerous calamities in this magnificent capital, adorned with innumerable monuments. Here too I obtained a situation . . . I obtained it and I lost it again. Do you understand? This time it was through my own fault I lost it: for my weakness had come out . . . We have now part of a room at Amalia Fydorovna Lippevechsel's; and what we live upon and what we pay our rent with, I could not say. There are a lot of people living there besides ourselves. Dirt and disorder, a perfect Bedlam . . . hm . . . yes . . . And meanwhile my daughter by

my first wife has grown up; and what my daughter has had to put up with from her step-mother whilst she was growing up, I won't speak of. For, though Katerina Ivanova is full of generous feelings, she is a spirited lady, irritable and short-tempered . . ."

From *Crime and Punishment* © 1956 by Fyodor Dostoevsky. Published by Random House, Inc.

How do you think Katerina feels about her life? How do you think she feels about her husband? Develop and support your conclusions by using details from the excerpt.

GRADE 10 MATHEMATICS



Grade 10 Mathematics Proficiency Level Distribution: 1994-1996*

Proficiency Level/Year	1992	1994	1996
Below Level 1	-	13	12
Level 1 and Above	-	87	88
Level 2 and Above	-	51	55
Level 3 and Above	-	20	22
Level 4	-	7	6

*Grade 10 testing began in 1994.

Grade 10 Mathematics - Selected Subcategory Scaled Scores

	1994	1996
Measurement/Geometry	1300	1310
Variables/Relations	1300	1310
Probability/Statistics	1300	1300

Sample Multiple-Choice Question

What is the value of x that satisfies the equation below?
3x + 6 − 14 = x + 2

A. 4
B. 5
C. 1 ½
D. -6

Sample Open-Ended Question

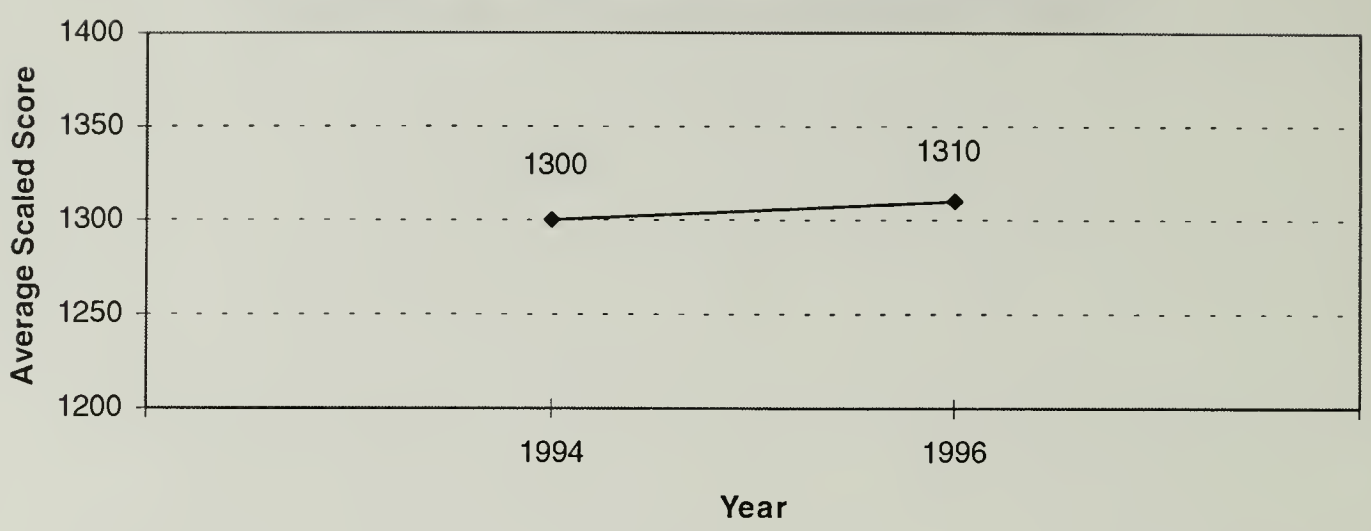
The temperature recorded in Quebec City on January 18 at 11:00 A.M. was 2°C. The temperature recorded at the same date and time in Portland was 48°F.

a. What was the difference in temperature between the two locations? Show your work.

(NOTE: F° = 9/5 C° + 32°)

b. Using the equation above, draw a graph in your answer booklet to show the relationship between Fahrenheit and Celsius temperatures.

GRADE 10 SCIENCE



Grade 10 Science Proficiency Level Distribution*

Proficiency Level/Year	1992	1994	1996
Below Level 1	-	13	11
Level 1 and Above	-	87	89
Level 2 and Above	-	54	57
Level 3 and Above	-	21	21
Level 4	-	7	4

*Grade 10 testing began in 1994.

Grade 10 Science - Selected Subcategory Scaled Scores

	1994	1996
Scientific Inquiry	1300	1320
Life Science	1300	1310
Earth/Space Science	1300	1290
Physical Science	1300	1320

Scientific Inquiry counts for half of the total science score, and includes three major components, as follows.

- Designing Investigations: students are expected to identify the best step or sequence of steps to investigate a problem or answer a question.
- Data Gathering: students should be able to determine the best method to collect information in a situation, identify appropriate instruments, and make observations.
- Data Interpretation: students are asked to demonstrate the ability to read and interpret graphs and tables, and draw and evaluate conclusions from data.

Sample Multiple-Choice Question

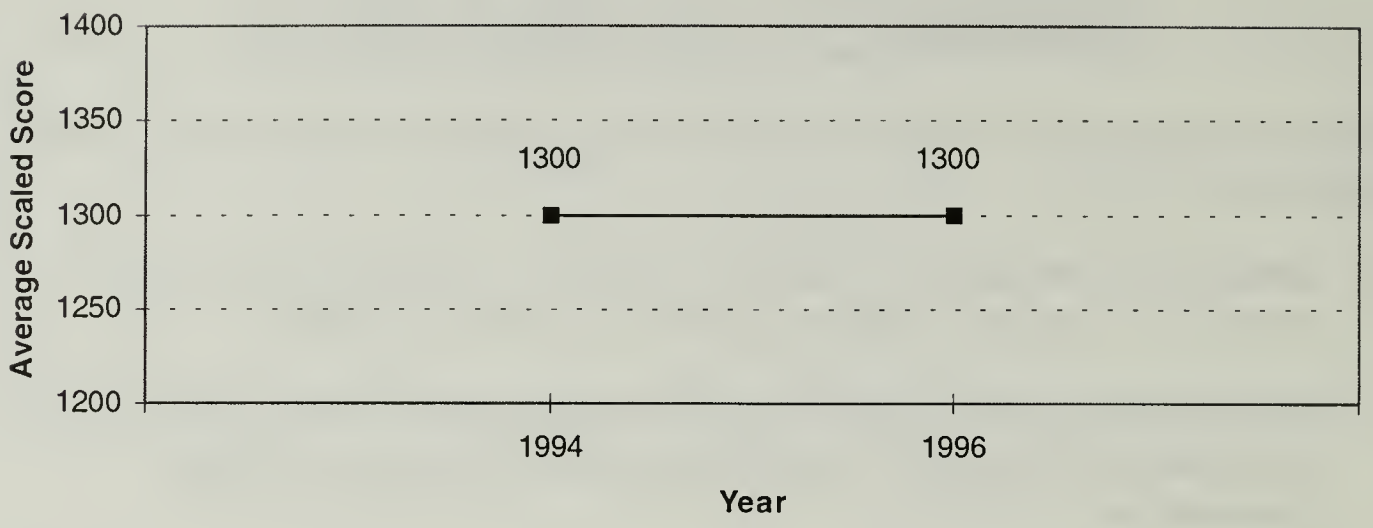
Which one of the following is true about cellular respiration?
A. It is performed by all plants and animals.
B. It is performed by all animals but only by a few plants.
C. It is performed by all plants but only a few animals.
D. It is performed only by vertebrate animals and green plants.

Sample Open-Ended Question

A burning match has a much higher temperature than a radiator in a room. Yet the radiator supplies more heat to the room than the burning match. Explain how this is possible.

GRADE 10 SOCIAL STUDIES

Grade 10 Social Studies Scaled Scores: 1994-1996



Grade 10 Social Studies Proficiency Level Distribution: 1994-1996*

Proficiency Level/Year	1992	1994	1996
Below Level 1	-	14	13
Level 1 and Above	-	86	87
Level 2 and Above	-	52	56
Level 3 and Above	-	21	21
Level 4	-	7	5

*Grade 10 testing began in 1994.

Grade 10 Social Studies - Selected Subcategory Scaled Scores

	1994	1996
Historical Environment	1300	1300
Economic Environment	1300	1270
Sociocultural Environment	1300	1310
Process Skills	1300	1310

- Historical Environment includes questions about United States and world history as well as contemporary history.
- Economic Environment, which includes six percent of the test items, covers economic systems, factors influencing purchasing power, and world economic interdependence.
- Process Skills include map skills, interpreting information presented graphically, referencing skills, and data-gathering techniques needed for social studies research.

Sample Multiple-Choice Question

What is a similarity between the lives of serfs on European feudal manors and farmers during Japan's feudal period?

A. Rulers encouraged equal economic opportunities for these groups.
B. The people in these groups had much political power.
C. People born into these groups had limited social and economic opportunities.
D. Religion played a minor role in the daily affairs of these groups.

Sample Open-Ended Question

The map below shows several regions where civilization developed.

- Explain why civilizations were able to grow in these areas.
- Identify each of the four civilizations by number and then discuss the contributions of each.

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